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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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| 10/796,394 | 03/09/2004 | Takuya Tsukagoshi | 890050.468 | 1892 |

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| EXAMINER | |
|---|---|
| LAVARIAS, ARNEL C | |
| ART UNIT | PAPER NUMBER |
| 2872 | |

| SHORTENED STATUTORY PERIOD OF RESPONSE | MAIL DATE | DELIVERY MODE |
|---|---|---|
| 3 MONTHS | 03/13/2007 | PAPER |

**Please find below and/or attached an Office communication concerning this application or proceeding.**

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

| Office Action Summary | Application No. | Applicant(s) | |
|---|---|---|---|
| | 10/796,394 | TSUKAGOSHI, TAKUYA | |
| | Examiner | Art Unit | |
| | Arnel C. Lavarias | 2872 | |

*-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --*

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

1)☒ Responsive to communication(s) filed on *25 January 2007*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

4)☒ Claim(s) *1-3* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-3* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

**Application Papers**

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

## DETAILED ACTION

### *Response to Amendment*

1. The amendments to Claim 1 in the submission dated 1/25/07 are acknowledged and accepted.

### *Response to Arguments*

2. The Applicant's arguments filed 1/25/07 have been fully considered but they are not persuasive.

3. The Applicant argues that, with respect to newly amended Claim 1, as well as Claims 2-3 which depend on Claim 1, Chou et al., Curtis et al., and Bernal et al. fail to teach or reasonably suggest a pinhole disposed at a confocal point of the Fourier transform lens and the reverse Fourier transform lens without having to reposition the confocal point prior to projecting the signal beam and the reference beam. The Examiner respectfully disagrees. Referring specifically to Curtis et al., the Examiner notes that no mention is made in Curtis et al. of specifically "repositioning" the confocal point or moving such confocal point prior to projecting the signal and reference beams. The optical arrangements (See for example Figures 6-7, 10-11, 13-14 of Curtis et al.) disclosed by Curtis et al. are specifically designed so as to place the confocal point of the Fourier and reverse Fourier lenses either in front of or behind the Fourier plane. In other words, the elements in the optical arrangements are arranged and fixed in place prior to the use of the optical arrangements. At no time are these elements moved. Further, the Examiner

notes that one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

4. The Applicants further argue that, with respect to newly amended Claim 1, as well as Claims 2-3 which depend on Claim 1, Chou et al., Tanaka et al., and Bernal et al. fail to teach or reasonably suggest a pinhole disposed at a confocal point of the Fourier transform lens and the reverse Fourier transform lens. The Examiner respectfully disagrees. Again, the Examiner notes that one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

5. Claims 1-3 are now rejected as follows.

***Claim Rejections - 35 USC § 112***

6. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

7. Claims 1-3 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the

relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

Claim 1 recites the limitation "... a pinhole disposed at a confocal point of the Fourier transform lens and the reverse Fourier transform lens without having to reposition the confocal point prior to projecting the signal beam and the reference beam...". Neither the specification nor the drawings of the instant disclosure discuss that the pinhole must be located without having to reposition the confocal point prior to projecting the signal beam and the reference beams. Further, such a limitation does not appear to be inherent to the optical arrangements disclosed in the instant application. Claims 2-3 are dependent on Claim 1, and hence inherit the deficiencies of Claim 1.

***Claim Rejections - 35 USC § 103***

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

9. Claims 1-2 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chou et al. (W. Chou, M. A. Neifeld, 'Interleaving and error correction in volume holographic memory systems', Appl. Opt., vol. 37, no. 29, October 10, 1998, pp. 6951-6968.), of record, in view of Curtis et al. (U.S. Patent No. 6163391), of record, and Bernal et al. (M. P. Bernal, G. W. Burr, H. Coufal, M. Quintanilla, 'Noise in high-areal-density

holographic data storage systems', Opt. Soc: America, Washington, D.C., USA, May 1998, pp. 21-22.), of record.

Chou et al. discloses a holographic recording and reproducing apparatus (See for example Figure 1; Section 2A) for recording data as phase information of light in a holographic recording medium (See 'memory' in Figure 1) by projecting a signal beam and a reference beam thereonto, the holographic recording and reproducing apparatus comprising at least a spatial light modulator (See 'SLM' in Figure 1), a Fourier transform lens (See 'lens 1' in Figure 1), a reverse Fourier transform lens (See 'lens 2' in Figure 1), and a CCD image sensor (See 'CCD' in Figure 1), the holographic recording medium being disposed between the Fourier transform lens and the reverse Fourier transform lens, the focal length of the Fourier transform lens is set to be different (e.g. longer) than that of the reverse Fourier transform lens (See Sections 4C, 4D); and the focal length of the Fourier transform lens and the focal length of the reverse Fourier transform lens remaining unchanged (It is noted that the Fourier and inverse Fourier transform lenses of Chou et al. do not move prior, during, or after holographic recording and reproduction of information). Chou et al. lacks a pinhole disposed at a confocal point of the Fourier transform lens and the reverse Fourier transform lens without having to reposition the confocal point prior to projecting the signal beam and the reference beam, such that the pinhole is disposed either between the holographic recording medium and the Fourier transform lens or between the holographic recording medium and the reverse Fourier transform lens. However, Curtis et al. teaches a conventional method and apparatus for holographic data storage (See for example Figures 1, 15), wherein the holographic

recording medium (See for example 30 in Figure 1; 520 in Figure 15) may be located away from the focal point of the incident Fourier transform lens (See for example Figures 6-7, 10-11, 13-14). This repositioning of the focal point of the Fourier transform lens may be performed by positioning the recording medium away from the focal point of the Fourier transform lens (See for example Figure 13) or by utilizing additional powered lenses (See for example 390/395 in Figure 10; 405 in Figure 11) in conjunction with the Fourier transform lens to adjust the convergence or divergence of the incident light beam (See col. 10, line 1-col. 12, line 29). Further, the lenses, including both the Fourier transform lens and the inverse Fourier transform lens as well as the power optic (See Figures 6-7, 10-11, 13-14) do not move prior, during, or after the recording and reproduction of information, and thus the focal length of the Fourier transform lens and focal length of the reverse Fourier transform lens remain unchanged during the recording and reproduction of the information. In addition, Bernal et al. teaches a digital holographic storage system utilizing a 4F lens design (See Figure 1), wherein an aperture is placed at the Fourier plane of the 4F system (it is noted that this Fourier plane occurs at the confocal point of the Fourier (See $L_1$ in Figure 1) and reverse Fourier (See $L_2$ in Figure 1) lenses at point 'D'). Also, the Fourier and inverse Fourier transform lenses (See $L_1$, $L_2$ in Figure 1) of Bernal et al. do not move prior, during, or after holographic recording and reproduction of information. Thus, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have the apparatus of Chou et al. further comprise a pinhole disposed at a confocal point of the Fourier transform lens and the reverse Fourier transform lens without having to reposition the

confocal point prior to projecting the signal beam and the reference beam, such that the pinhole is disposed either between the holographic recording medium and the Fourier transform lens or between the holographic recording medium and the reverse Fourier transform lens, as taught by Curtis et al. and Bernal et al., for the purpose of 1) minimizing the sensitivity of the holographic recording medium to shrinkage due to curing or temperature changes and 2) minimizing crosstalk noise.

10. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Chou et al. in view of Curtis et al. and Bernal et al.

Chou et al. in view of Curtis et al. and Bernal et al. discloses the invention as set forth above, except for the focal length of the reverse Fourier transform lens being set longer than that of the Fourier transform lens. However, since Chou et al. already discloses that the focal length of the Fourier transform lens may be longer than or equal to that of the reverse Fourier transform lens, one of ordinary skill would have also been likely to design a similar holographic recording and reproducing apparatus utilizing an asymmetrical 4F lens design, wherein the focal length of the Fourier transform lens is shorter than that of the reverse Fourier transform lens (i.e. the focal length of the reverse Fourier transform lens is longer than that of the Fourier transform lens), particularly when there is a mismatch in pixel sizes between the SLM and the CCD. Thus, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have the focal length of the reverse Fourier transform lens be set longer than that of the Fourier transform lens in the holographic recording and reproducing apparatus of Chou et

al. in view of Curtis et al. and Bernal et al., for the purpose of optimizing the light throughput of the optical system, while reducing unwanted errors due to optical noise.

11. Claims 1-2 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chou et al. (W. Chou, M. A. Neifeld, 'Interleaving and error correction in volume holographic memory systems', Appl. Opt., vol. 37, no. 29, October 10, 1998, pp. 6951-6968.), of record, in view of Tanaka et al. (U.S. Patent No. 6301028), of record, and Bernal et al. (M. P. Bernal, G. W. Burr, H. Coufal, M. Quintanilla, 'Noise in high-areal-density holographic data storage systems', Opt. Soc. America, Washington, D.C., USA, May 1998, pp. 21-22.), of record.

Chou et al. discloses a holographic recording and reproducing apparatus (See for example Figure 1; Section 2A) for recording data as phase information of light in a holographic recording medium (See 'memory' in Figure 1) by projecting a signal beam and a reference beam thereonto, the holographic recording and reproducing apparatus comprising at least a spatial light modulator (See 'SLM' in Figure 1), a Fourier transform lens (See 'lens 1' in Figure 1), a reverse Fourier transform lens (See 'lens 2' in Figure 1), and a CCD image sensor (See 'CCD' in Figure 1), the holographic recording medium being disposed between the Fourier transform lens and the reverse Fourier transform lens, the focal length of the Fourier transform lens is set to be different (e.g. longer) than that of the reverse Fourier transform lens (See Sections 4C, 4D); and the focal length of the Fourier transform lens and the focal length of the reverse Fourier transform lens remaining unchanged (It is noted that the Fourier and inverse Fourier transform lenses of Chou et al. do not move prior, during, or after holographic recording and reproduction of

information). Chou et al. lacks a pinhole disposed at a confocal point of the Fourier transform lens and the reverse Fourier transform lens without having to reposition the confocal point prior to projecting the signal beam and the reference beam, such that the pinhole is disposed either between the holographic recording medium and the Fourier transform lens or between the holographic recording medium and the reverse Fourier transform lens. However, Tanaka et al. teaches a conventional apparatus for holographic data storage (See for example Figure 9), wherein the holographic recording medium (See for example 10 in Figure 9) may be located away from the focal point of the incident Fourier transform lens (See for example 13 in Figure 9). Further, in Tanaka et al., a pinhole (See 50 in Figure 9) may be disposed at the confocal point of the Fourier transform lens and the inverse Fourier transform lens (See 21 in Figure 9), such that the pinhole as well as the focal point are disposed between the holographic recording medium and the Fourier transform lens. Further, both the Fourier transform lens and the inverse Fourier transform lens (See 13, 21 in Figure 9) do not move prior, during, or after the recording and reproduction of information, and thus the focal length of the Fourier transform lens and focal length of the reverse Fourier transform lens remain unchanged during the recording and reproduction of the information. In addition, Bernal et al. teaches a digital holographic storage system utilizing a 4F lens design (See Figure 1), wherein an aperture is placed at the Fourier plane of the 4F system (it is noted that this Fourier plane occurs at the confocal point of the Fourier (See $L_1$ in Figure 1) and reverse Fourier (See $L_2$ in Figure 1) lenses at point 'D'). Also, the Fourier and inverse Fourier transform lenses (See $L_1$, $L_2$ in Figure 1) of Bernal et al. do not move prior, during, or

after holographic recording and reproduction of information. Thus, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have the apparatus of Chou et al. further comprise a pinhole disposed at a confocal point of the Fourier transform lens and the reverse Fourier transform lens without having to reposition the confocal point prior to projecting the signal beam and the reference beam, such that the pinhole is disposed either between the holographic recording medium and the Fourier transform lens or between the holographic recording medium and the reverse Fourier transform lens, as taught by Tanaka et al. and Bernal et al., for the purpose of 1) minimizing the sensitivity of the holographic recording medium to shrinkage due to curing or temperature changes, 2) minimizing crosstalk noise, and 3) maximize storage density of the holographic recording medium.

12. Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over Chou et al. in view of Tanaka et al. and Bernal et al.

Chou et al. in view of Tanaka et al. and Bernal et al. discloses the invention as set forth above, except for the focal length of the reverse Fourier transform lens being set longer than that of the Fourier transform lens. However, since Chou et al. already discloses that the focal length of the Fourier transform lens may be longer than or equal to that of the reverse Fourier transform lens, one of ordinary skill would have also been likely to design a similar holographic recording and reproducing apparatus utilizing an asymmetrical 4F lens design, wherein the focal length of the Fourier transform lens is shorter than that of the reverse Fourier transform lens (i.e. the focal length of the reverse Fourier transform lens is longer than that of the Fourier transform lens), particularly when

there is a mismatch in pixel sizes between the SLM and the CCD. Thus, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have the focal length of the reverse Fourier transform lens be set longer than that of the Fourier transform lens in the holographic recording and reproducing apparatus of Chou et al. in view of Tanaka et al. and Bernal et al., for the purpose of optimizing the light throughput of the optical system, while reducing unwanted errors due to optical noise.

***Conclusion***

13. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

14. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Arnel C. Lavarias whose telephone number is 571-272-2315. The examiner can normally be reached on M-F 9:30 AM - 6 PM EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Stephone B. Allen can be reached on 571-272-2434. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Arnel C. Lavarias
Primary Examiner
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3/8/07

ARNEL LAVARIAS
PRIMARY PATENT EXAMINER